

IN THE CLAIMS

Please substitute the claim set in the appendix entitled Clean Version of Pending Claims for the previously pending claim set. The substitute claim set is intended to reflect amendment of previously pending claims 1-3, 5, 7-9, 25, 27, 30-40, and addition of new claims ~~41-44~~⁵⁰⁻⁵³. The specific amendments to individual claims are detailed in the following marked up set of claims.

1. [Amended Once] A method for fabricating a fluidic system, comprising:
depositing a floor layer on [the top] a first surface of a substrate;
depositing a silicon sacrificial layer on the [top] first surface of said floor layer;
patterning said silicon sacrificial layer to define in the silicon sacrificial layer the shape of a desired fluid working gap;
depositing a ceiling layer to cover said silicon sacrificial layer; and
removing said silicon sacrificial layer from between said floor layer and said ceiling layer to produce said working gap.
2. [Amended Once] The method of claim 1, wherein removing said silicon sacrificial layer includes:
providing at least one access hole leading to said silicon sacrificial layer; and
etching said silicon sacrificial layer through said at least one access hole.
3. [Amended Once] The method of claim 2, wherein providing said at least one access hole includes forming at least one hole through said ceiling layer to said silicon sacrificial layer.
5. [Amended Once] The method of claim 1, wherein patterning includes:
defining in said sacrificial layer the boundaries of a fluid chamber working gap; and
defining within the boundaries of said fluid chamber a multiplicity of holes extending through said silicon sacrificial layer to said dielectric floor layer.

7. [Amended Once] The method of claim 6, wherein removing said silicon sacrificial layer includes etching said silicon sacrificial layer between said obstacles in said working gap to produce an artificial gel.

8. [Amended Once] The method of claim 1, further including, after depositing said dielectric ceiling layer:

 patterning and etching said ceiling layer to form a ridge waveguide intersecting the location of a desired fluid working gap;

 patterning and etching said ceiling layer to define at least one access hole leading to said sacrificial layer; and

 thereafter removing said silicon sacrificial layer by etching.

9. [Amended Once] A method for fabricating a multilevel fluidic device, comprising:

 forming a first floor layer; depositing a first sacrificial layer on [the top] a first surface of said floor layer;

 patterning said sacrificial layer to define in the sacrificial layer the shape of a desired fluid working gap;

 depositing a ceiling layer to cover said sacrificial layer;

 patterning said second sacrificial layer to define in the second sacrificial layer a second desired fluid gap;

 depositing a second ceiling layer to cover said second sacrificial layer; and

 removing said sacrificial layers to produce multilevel working gaps wherein at least one of the sacrificial layers is a silicon material.

25. [Amended Once] A method of forming a fluidic system, the method comprising:

 forming a patterned silicon based sacrificial layer on a substrate;

 forming a ceiling layer on the patterned sacrificial layer; and

 removing the patterned sacrificial layer.

27. [Amended Once] A method of forming a fluidic system, the method comprising:
forming a patterned silicon based sacrificial layer on a substrate;
forming a ceiling layer on the patterned silicon based sacrificial layer;
forming access holes through the ceiling layer to the patterned silicon based sacrificial layer; and
removing the patterned silicon based sacrificial layer via the access holes.

[30] 29. [Amended Once] The method of claim 27 wherein the substrate comprises a floor layer forming a floor of the fluidic system.

[31] 30. [Amended Once] A method of forming fluidic systems, the method comprising:
forming a patterned sacrificial layer on a substrate;
forming a ceiling layer on the patterned sacrificial layer;
forming access holes through the ceiling layer to the patterned sacrificial layer;
removing the patterned sacrificial layer via the access holes; and
covering the access holes such that the fluidic systems are defined by the ceiling layer and substrate.

[32] 31. [Amended Once] The method of claim [31] 30 wherein the substrate comprises a floor layer forming a floor of the fluidic systems.

[33] 32. [Amended Once] The method of claim [31] 30 wherein the ceiling layer comprises a dielectric material.

[34] 33. [Amended Once] The method of claim [31] 30 wherein the sacrificial layer comprises amorphous silicon or polysilicon.

[35] 34. [Amended Once] The method of claim [31] 30 wherein the fluidic systems comprise channels.

[36] 35. [Amended Once] The method of claim [31] 30 and further comprising forming further fluidic devices on top of the already formed fluidic systems and forming interconnects therebetween.

[37] 36. [Amended Once] The method of claim [31] 30 wherein the layers are formed using chemical vapor deposition.

[38] 37. [Amended Once] The method of claim [31] 30 wherein the sacrificial layer is removed by providing an etchant through the access holes.

[39] 38. [Amended Once] The method of claim [38] 37 wherein the etchant comprises tetramethyl ammonium hydroxide.

[40] 39. [Amended Once] A method of forming fluidic devices, the method comprising:
depositing sacrificial layer on a substrate;
lithographically patterning the sacrificial layer;
depositing a ceiling layer on the patterned sacrificial layer;
forming access holes through the ceiling layer to the patterned sacrificial layer;
etching the patterned sacrificial layer via the access holes; and
oxidizing the access holes.

41. [New] A method for fabricating a fluidic system, comprising:
depositing a floor layer supported by the surface of a substrate;
depositing a sacrificial layer on the surface of the floor layer;
defining in the sacrificial layer the boundaries of a fluid chamber working gap; and
defining within the boundaries of the fluid chamber a multiplicity of holes extending through said sacrificial layer to the dielectric floor layer;
depositing a ceiling layer to cover the sacrificial layer, wherein the ceiling layer is

deposited in the multiplicity of holes to define retarding obstacles in the working gap; and

removing the sacrificial layer from between said floor layer and said ceiling layer to produce said working gap having the retarding obstacles.

42. [New] The method of claim 41, wherein removing the sacrificial layer includes etching the sacrificial layer between the retarding obstacles in the working gap such that the retarding obstacles significantly influence the motion of molecules.

43. [New] A semiconductor processing method of forming a nanochannel, comprising:
depositing a thin film silicon sacrificial layer on a substrate;
patterning the thin film silicon sacrificial layer to define a sacrificial channel having the shape of a desired nanochannel;
depositing a ceiling layer to cover the sacrificial channel; and
removing the sacrificial channel from under the ceiling layer to produce a nanochannel.

44. [New] The method of claim 43 wherein the sacrificial layer has a thickness between approximately 120 nm and 540 nm.

REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on August 29, 2002, and the documents cited therewith.

Claims 1-3, 5, 7-9, 25, 27, 30-40, are amended. Claims 41-44 are added. As a result, claims 1-39 and 41-44 are now pending in this application.

Claim Objections

Claims 29-40 were objected to because of informalities in the claim numbering. The amendments made herein to the claims are believed to overcome this objection.

§112 Rejection of the Claims

Claims 5-19 and 23 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

§102 Rejection of the Claims

Claims 1, 2, 20-22, 25 and 26 were rejected under 35 USC § 102(e) as being anticipated by Mastrangelo et al. (U.S. 6,136,212). This rejection is respectfully traversed.

Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. *In re Dillon* 919 F.2d 688, 16 USPQ 2d 1897, 1908 (Fed. Cir. 1990) (en banc), cert. denied, 500 U.S. 904 (1991). It is not enough, however, that the prior art reference discloses all the claimed elements in isolation. Rather, “[a]nticipation requires the presence in a single prior reference disclosure of each and every element of the claimed invention, *arranged as in the claim.*” *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)) (emphasis added).

Mastrangelo et al. uses “polymer-based micromachining technology [that] is vastly superior than those based on wafer bonding bulk micromachining, polysilicon surface micromachining, and hybrid plastic ‘circuit board’ technology in the following nine categories” Col. 5, lines 19-24. This is followed by a recitation of the nine reasons, why the process is through to be better than silicon based processes. Claims 1-2, 20-22 and 25-26 all refer to a silicon based sacrificial layer, which is directly against the teaching of Mastrangelo et al. As such, it clearly distinguishes, and the rejection should be withdrawn.

§103 Rejection of the Claims

Claims 3, 4, 27, 28, 30, 31, 32, 25, 38 and 39 were rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. (‘212) and further in view of Lin et al. (U.S. 5,591,139). This rejection is respectfully traversed.

The Examiner has the burden under 35 U.S.C. § 103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). To do that the Examiner must show that some objective teaching in the prior art or some knowledge generally available to one of ordinary skill in the art would lead an individual to combine the relevant teaching of the references. *Id.*

The *Fine* court stated that:

Obviousness is tested by "what the combined teaching of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 878 (CCPA 1981)). But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *ACS Hosp. Sys.*, 732 F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined *only* if there is some suggestion or incentive to do so." *Id.* (emphasis in original).

The M.P.E.P. adopts this line of reasoning, stating that

In order for the Examiner to establish a *prima facie* case of obviousness, three base criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *M.P.E.P.* § 2142 (citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir. 1991)).

An invention can be obvious even though the suggestion to combine prior art teachings is not found in a specific reference. *In re Oetiker*, 24 USPQ2d 1443 (Fed. Cir. 1992). At the same time, however, although it is not necessary that the cited references or prior art specifically suggest making the combination, there must be some teaching somewhere which provides the suggestion or motivation to combine prior art teachings and applies that combination to solve the same or similar problem which the claimed invention addresses. One of ordinary skill in the art will be presumed to know of any such teaching. (See, e.g., *In re Nilssen*, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988) and *In re Wood*, 599 F.2d 1032, 1037, 202 USPQ 171, 174 (CCPA 1979)).

Applicant respectfully submits that the Office Action did not make out a *prima facie* case of obviousness. Lin et al. uses a phosphosilicate glass to define a needle. Thus, it does not provide the elements that are missing from the independent claims as described above. Each of the claims references a silicon based sacrificial layer. As neither of the references nor their combination teach or suggest the invention as claimed, the rejection should be withdrawn.

There is also no suggestion to combine Mastrangelo et al. and Lin et al. In fact, Mastrangelo et al. teaches away from polysilicon based processes, which indicates that the references cannot be combined. A factor cutting against a finding of motivation to combine or modify the prior art is when the prior art teaches away from the claimed combination. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path the applicant took. *In re Gurley*, 27 F.3d 551, 31 USPQ 2d 1130, 1131 (Fed. Cir. 1994); *United States v. Adams*, 383 U.S. 39, 52, 148 USPQ 479, 484 (1966); *In re Sponnoble*, 405 F.2d 578, 587, 160 USPQ 237, 244 (C.C.P.A. 1969); *In re Caldwell*, 319 F.2d 254, 256, 138 USPQ 243, 245 (C.C.P.A. 1963). The rejection should be withdrawn.

With respect to claim 38, the Office Action indicates that tetramethyl ammonium hydroxide is disclosed in Lin et al. at col. 5, lines 57-64. No such teaching is found by Applicants. ^ ^

Claims 5-7 were also rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. ('212), and further in view of Mastrangelo et al. (U.S. 5,258,097). This rejection is respectfully traversed. Claims 5-7 depend from claim 1, and neither references shows the use of a silicon sacrificial layer, and in fact teach away from such a silicon based process as noted above.

Claims 9 and 10 were also rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. ('212) in view of Frazier (U.S. 5,871,158). This rejection is respectfully traversed. Claim 9 was amended to reference a silicon material as one of the sacrificial layers.

Claims 11-15 were also rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. ('212), and further in view of Lin et al. Claims 11-15 depend from claim 9. As previously indicated, Mastrangelo et al. and Lin et al. are not properly combinable, and even if combined do not show each and every element of the invention.

Claims 16-19 were also rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. ('212), and further in view of Mastrangelo et al. ('097). Claims 16-19 further depend from claim 9. Neither Mastrangelo et al. reference disclose the use of silicon as a sacrificial layer, and in fact teach against such use. The rejection should be withdrawn. Further, Mastrnagelo et al '097 does not disclose the formation of an artificial gel. The structures are clearly only for support. They do not perform the function of a gel, and therefore, the combination does not show each and every element of the invention as claimed.

Claims 33 and 34 were also rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. ('212), and further in view of Tai et al. (U.S. 6,146,543). Since Mastrangelo et al. strenuously teaches away from the use of a silicon based method, the rejection is respectfully traversed.

Claim 36 was also rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. ('212), and further in view of Frazier. This rejection is also respectfully traversed, as neither reference discloses the use of silicon as a sacrificial layer.

Claim 37 was also rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. ('212), and further in view of Vaeth (US 2001/0005527). This rejection is also respectfully traversed, as neither reference discloses the use of silicon as a sacrificial layer.

Claim 40 was also rejected under 35 USC § 103(a) as being unpatentable over Mastrangelo et al. ('212), and further in view of Lin et al. and further in view of Nakagima et al.

(U.S. 4,698,407). This rejection is respectfully traversed. There is no suggestion to combine the references, and even if such a suggestion were found, the combination does not show each and every element of the claimed invention.

The Office Action must provide specific, objective evidence of record for a finding of a suggestion or motivation to combine reference teachings and must explain the reasoning by which the evidence is deemed to support such a finding. *In re Sang Su Lee*, 277 F.3d 1338, 61 U.S.P.Q.2d 1430 (Fed. Cir. 2002). The Office Action stated "it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Mastrangelo et al to form the access hole through the ceiling layer as taught by Lin et al and to oxidize the access holes as taught by Nakagima et al because the formation of the access holes through the ceiling layer are easier to seal and the oxidation of the access holes are needed to seal the access hole openings in order to fabricate a sealed device," which is a mere conclusory statement of subjective belief. It further impermissibly uses the current invention as a roadmap to make the combination. Applicant respectfully submits that the Office Action has not provided objective evidence for a suggestion or motivation to combine the references and the rejection should be withdrawn.

New claims 41-44 have been added. These claims describe the formation of retarding obstacles, and their function of performing like a gel, such as is used in electrophoresis. The use of retarding obstacles is not shown in any of the references.

Allowable Subject Matter

Claim 24 was allowed.

Claims 8 and 19 were indicated to be allowable if rewritten to overcome the rejection under 35 USC § 112 set forth in the Office Action and to include all of the limitations of the base claim and any intervening claims. Such claims have not been rewritten at this time.

Claim 23 was indicated to be allowable if rewritten to overcome the rejection under 35 USC § 112 set forth in the Office Action. Such claim has not been rewritten at this time.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney ((612) 373-6972) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

HAROLD G. CRAIGHEAD ET AL.

By their Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.

P.O. Box 2938

Minneapolis, MN 55402

(612) 373-6972

Date 11/12/2002

By



Bradley A. Forrest

Reg. No. 30,837

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 13th day of November, 2002.

Anne M. Richards

Name


Signature